PATENT SPECIFICATION (11) 1 392 192

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(21) Application No. 33793/71 (22) Filed 19 July 1971

(23) Complete Specification filed 11 July 1972

(44) Complete Specification published 30 April 1975

(51) INT. CL.* B65D 83/14

(52) Index at acceptance

F1R 3A3D11 3A3D12C 3A3D1 3A3D2 3A3D4D 3A3D5 B8N 4C3

(19)

(54) IMPROVEMENTS IN OR RELATING TO DEVICES FOR DISPENSING FLUIDS FROM PRESSURISED DISPENSING CONTAINERS

(71) We, BESPAK INDUSTRIES LIMITED, a British Company, of Fieldings Road, Cheshunt, Waltham Cross, Hertfordshire, and WILLIAM EDWARD WARREN, a British Subject, of 14 High Ridge, Cuffley, Hertfordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to devices for dispensing fluid from pressurised aerosol dispensing containers.

The invention provides an aerosol device comprising a housing in which is located a pressurised aerosol dispensing container of the type which has a tubular valve stem which is depressable against a spring means and internal valve means which is opened when the valve stem is depressed to deliver a discrete metered dose of fluid through the stem and is closed when the stem is released, the housing having receiving means for the container which makes sealing engagement with the stem of the container, and which resists movement of the stem away from the container, a duct in fluid connection with the receiving means, one end of the duct being open to the atmosphere and the other end thereof being arranged for insertion into the mouth of a user, a second valve means disposed exterior of the tubular valve stem to prevent flow of the metered dose from the stem into the duct after the stem has been depressed, a flow sensor arranged in the duct, and means to release the second valve means to allow the dose to flow into the duct when the flow sensor detects a flow of air in the duct caused by a user inhaling through the duct.

It is preferred that the second valve means is positioned so that the dose is stored partly in the stem and partly in the receiving means.

The aerosol dispensing container may be of the kind in which movement of the container body toward the spray head causes a dose of fluid to be ejected into the spray head.

Alternatively the aerosol dispensing container may be of the kind in which movement of the container body towards the spray head causes a dose of fluid to be prepared for ejection into the spray head and return movement of the body away from the spray head causes ejection of the dose. As a further alternative the aerosol dispensing container may be of the kind in which movement of the container body towards the spray head causes continuous flow of fluid into the spray head. To eject a dose with either of these two latter alternative aerosol dispensing containers it is necessary to move the container body towards the spray head and then away from the spray head.

The flow sensor preferably comprises a movable vane mounted in the duct.

The valve member may comprise a resilient member urgable against an aperture in the receiving means which aperture leads to a port in the duct.

Preferably the vane is pivotally mounted and the valve member is arranged on a lever rigidly mounted on the vane.

The valve may be spring urged against the said aperture (e.g. by a spring connected to the vane).

The device may include means for relieving the seating pressure of the valve when the device is not in use.

Some specific examples of inhaling devices constructed according to the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a side view in section of an inhaling device;

Figure 2 is a sectional view of one alternative form of device, and

Figure 3 is a sectional view of another alternative device.

Referring to Figure 1, an inhaling device for dispensing medicament to, for instance, asthma sufferers comprises a plastics casing 11 having an outlet orifice 12 of a suitable size and shape for insertion into the mouth of the user. The casing 11 defines a recess 13 in which there is placed a pressurised aerosol medicament dispenser 14. The dispenser 14 is of a known type, and incorporates a metering valve 15 having a spray stem 16, which valve operates to eject into the stem 16 a predetermined amount of medicament when the dispenser 14 is pressed downwards while the stem 16 is supported against movement. The stem is received sealingly in socket 18.

Also fitted within casing 11 is a control assembly comprising a body 17, vane 31, lever 26 and socket 19. The socket 19 and body 17 are rigidly interconnected and lever 26, which is integral with vane 31, is pivotally mounted in the body 17 by means of a saddle 26*a* which straddles a flange 26*b*.

Socket 19 receives socket 18 and in the cavity between the two sockets there is arranged a resilient valve disc 22. Socket 19 has an outlet port 21. Valve member 22 is movable towards the socket 18 to seal an outlet 18*a* in the lower end thereof. An operating rod 23 mounted on the end of lever 26 passes through a bore 24 in socket 19 and engages the valve disc.

The control assembly lies partially within an air duct 28, leading from a set of inlet holes (not shown) at 29 on one side of vane 31 to the outlet orifice 12. The air vane 31 and the lever 26 including the saddle 26*a* and flange 26*b* form an air barrier between the inlet holes 29 and the outlet orifice 12. They are so dimensioned that air entering by the inlet holes 29 must pass up one side of the vane, over the top of the vane and down past the sockets 18 and 19 to reach the outlet orifice 12. Air cannot pass directly from inlet holes 29 past flange 26b to outlet orifice 12. A spring 30 connects the lever to the casing 11, and biases it in a counter clockwise direction. As a result of such biasing, the rod 23 is moved upwards and holds the valve member 22 against the socket 18 to seal it, while the air vane 31 is moved to a position in which it effectively closes duct 28 completely. A dust cap 32 is provided, which may be fitted over the outlet orifice 12, and the dust cap includes a tongue 33 engageable with an extension 34 on the lever 26 to move it downwardly, thus releasing the pressure on the valve member 22 when the device is not in use. The dust cap has a further tongue 32*a* to close the inlet holes.

In use of the device, the asthma sufferer inserts the outlet orifice 12 into his mouth, depresses the dispenser 14, and draws a breath. Depression of the dispenser 14 makes available partly in the stem 16 and partly in socket 18 a dose of medicament, but because the valve member 22 is held against the socket 18 by the rod 23, this dose is held back. When the user draws breath, a partial vacuum is created in the region of the valve member, with the result that the air pressure on the side of the vane 31 in communication with the inlet holes moves the vane, and thus the lever 26, in a clockwise direction, allowing air to flow past the vane. As the lever 26 moves, the valve member 22 is withdrawn from the socket 18, so that the air flowing past the valve assembly entrains the dose of medicament which passes from the stem 16 and socket 18 into the duct. Thus it will be seen that by the use of this device the asthma sufferer receives the dose of medicament at the very beginning of the intake of breath, thus ensuring that the medicament penetrates into the smallest airways in the lungs.

Two alternative forms of device are shown in Figures 2 and 3, in which like parts have been given like reference numerals. In both these devices, the valve member 22 is not moved into the sealing position until the moment at which the device is used. Referring first to Figure 2, the stem 16 of the dispenser 14 is fixed relative to the casing 11 and protrudes into the socket 19. The operating rod 23 of the valve assembly is mounted on a lever 35 pivoted to the casing 11 and is biased away from the valve assembly by a spring 36 connected to the lever 35. On the other end of the lever 35 is a trigger arm 37 engageable by a projection 38 rigidly connected to the air vane 31 (which is here pivoted on the casing 11). A further lever 39 is mounted on the casing 11 and is biased in a clockwise direction by a spring 41. One end of the lever 39 is connected by a push rod 42 to the dispenser 14, while the other end is engageable under a step in the trigger arm 37.

In the use of the device, the air vane 31 is initially in the position shown, blocking the inlet 29. The dispenser 14 is depressed to dispense a dose of medicament, and as it is depressed the push rod 42 rotates the lever 39 counter clockwise, so that the outer end of the lever lifts the trigger arm 37 and the lever 35 and thus raises the push rod, moving the valve member upwards to seal the stem 16 before the dose is actually dispensed. Thus, depression of the dispenser 14 makes the dose available, under pressure, in the stem 16. When the user of the device then sucks at the outlet

orifice 12, the partial vacuum within the air duct 28 results in the vane 31 rotating in a counterclockwise direction so that the projection 38 engages the top of the trigger arm and moves it away from the lever 39. The lever 35 then drops under the influence of spring 36, aided by the pressure of the medicament on the valve member 22, and the medicament is then dispensed into the air stream from the valve stem 16. When the dispenser 14 is released after breath has been drawn, a reset arm 43, rigidly connected to the lever 39, moves the vane 31 back to its start position. Projection 38, rigidly connected to vane 31, is thus also moved back into its start position.

Referring now to Figure 3, in this embodiment a lever 44 is used to operate dispenser 14; at the end of the lever 44 a vertically moving slide 45 is rigidly attached and is engageable with a projection 46 on the trigger arm 37. An interlock 47 between the vane 31 and the trigger arm 37 allows relative vertical movement of the arm and vane but ensures that counter clockwise rotation of the vane causes the trigger arm to move to the left, away from the slide 45. The operating rod 23, the lever 35, the spring 36 and the trigger arm are arranged in a similar manner to that shown in Figure 2, except that the fulcrum is positioned between the operation rod and the trigger arm rather than at one end of the lever.

In use of the device shown in Figure 3, the lever 44 is depressed, thus pressing the dispenser 14 to release a dose of medicament and at the same time depressing the trigger arm 37 via the slide 45 and the projection 46. This causes the lever 35 to rotate in a clockwise direction pushing the operating rod 23 and therefore the valve member 22 upwards to seal the dose dispensed in the stem 16 as in the other embodiments described. When the user draws breath through the orifice 12, the vane 31 is rotated counter clockwise and draws the projection 46 away from the slide 45, and when they disengage the spring 36 causes the valve assembly to dispense the dose available in the stem 16, the operating rod 23 being moved downwards. This arrangement has certain advantages, from a mechanical point of view, as the distances moved by the parts involved are increased, thus allowing greater manufacturing tolerances. Furthermore, the force required to operate the device is reduced by the use of the lever 44. The lever 44 and slide 45 are reset by the upward movement of the dispenser 14 after the lever 44 is released.

Generally, the invention provides a device by which the user can obtain the dose of medicament at the correct point in his drawing in of breath, and this is achieved in an arrangement in which the forces required are very low and the parts are not stressed except over the very short period of use. Previous devices have consisted of an arrangement in which an air vane is linked to the dispenser, it being necessary for the patient to suck at the orifice before, and during, depression of the dispenser. The air vane is held in a closed position until such time as the dispenser is operated, so that the patient obtains no air at all until such time as he operates the dispenser, and clearly this is undesirable for asthma sufferers who are in any case short of breath. In other devices, the drawing of breath by the patient triggers an arrangement which operates the metering valve directly, utilising the energy stored in a spring to overcome the considerable resistance (about 5 lbs) of the metering device. The present invention, on the other hand, utilises a two stage action in which the fluid is dispensed and stored by hand pressure on the dispenser and is released by an air vane arrangement on drawing breath, which release requires very little pressure.

The invention includes a miniature version of the present device operated by a battery. In this version there is no obstruction to the flow of air, but the commencement of flow is sensed by a "Pirani" type of gauge in a bridge circuit (e.g. a hot wire anemometer), and a tiny solenoid is switched to release the dose.

It may be desirable to provide means which prevent operation of the valve member 22 after the dispenser has been pressed downwardly until the dispenser is released. This would ensure that the user receives a single discrete dose at the start of drawing breath. For instance means may be provided to lock the vane 31 in the position shown in Figure 1 (i.e. the sealing position) when the dispenser 14 is in the depressed position.

WHAT WE CLAIM IS:—

1. An aerosol device comprising a housing in which is located a pressurised aerosol dispensing container of the type which has a tubular valve stem which is depressable against a spring means and internal valve means which is opened when the valve stem is depressed to deliver a discrete metered dose of fluid through the stem and is closed when the stem is released, the housing having receiving means for the container which makes sealing engagement with the stem of the container, and which resists movement of the stem away from the container, a duct in fluid connection with the receiving means, one end of the duct being open to the atmos-

phere and the other end thereof being arranged for insertion into the mouth of a user, a second valve means disposed exterior of the tubular valve stem to prevent flow of the metered dose from the stem into the duct after the stem has been depressed, a flow sensor arranged in the duct, and means to release the second valve means to allow the dose to flow into the duct when the flow sensor detects a flow of air in the duct caused by a user inhaling through the duct.

2. A device as claimed in claim 1 in which the second valve means is positioned so that the dose may be stored partly in the receiving means and partly in the stem.

3. A device as claimed in claim 1 in which the second valve means makes sealing engagement directly with the stem.

4. A device as claimed in any one of the preceding claims in which the flow sensor comprises a movable vane mounted in the duct.

5. A device as claimed in claim 4 in which the vane is pivotally mounted, and the valve member is arranged on a lever rigidly connected to the vane.

6. A device as claimed in claim 5 in which the valve member comprises a resilient member urgeable against an aperture in the receiving means which aperture leads to a port in the duct.

7. A device as claimed in claim 6 in which the valve is spring urged against the aperture.

8. A device as claimed in claim 6 including a dust cap mountable in the housing to close both ends of the duct, the cap having a member arranged to move the lever and vane to the position in which the valve member is released, so that when the device is not in use the pressure on the aperture exerted by the valve member is relieved.

9. A device substantially as hereinbefore described, with reference to and as shown in Figure 1, or Figure 2, or Figure 3 of the accompanying drawings.

BOULT, WADE & TENNANT,

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1975.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained

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2 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEET 1

Fig.1.

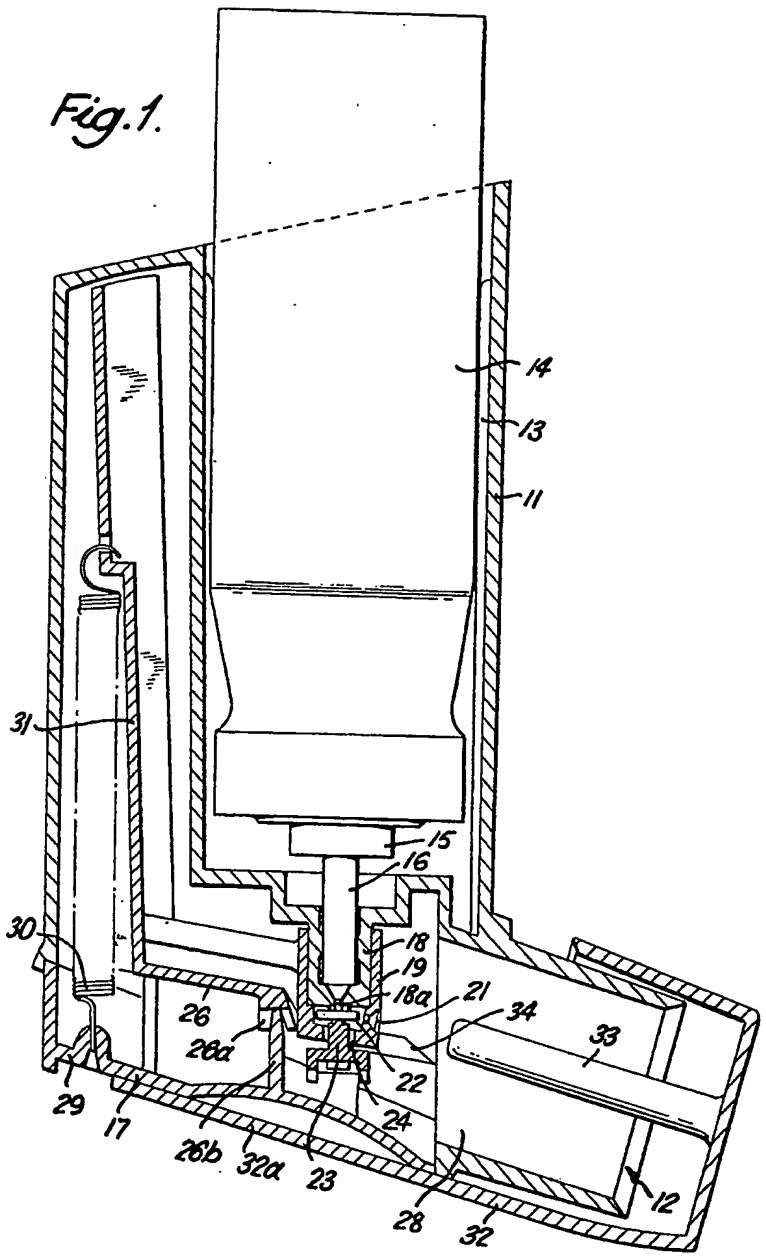

Fig.2.

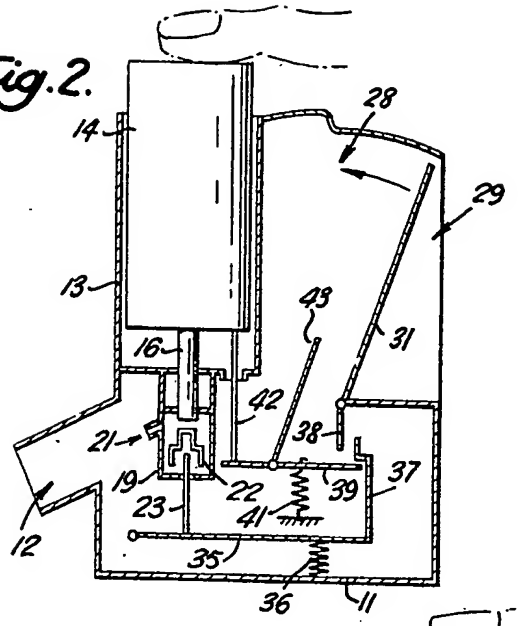
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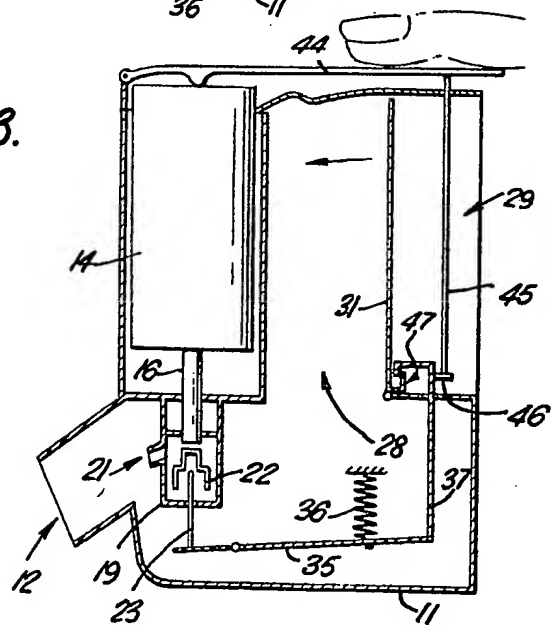
Fig.3.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